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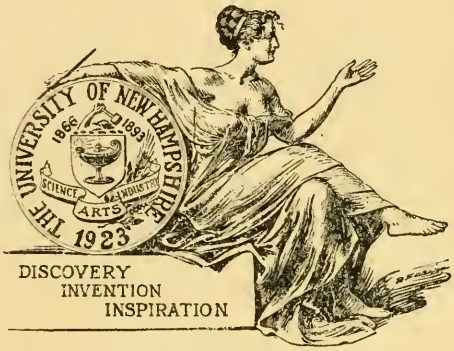

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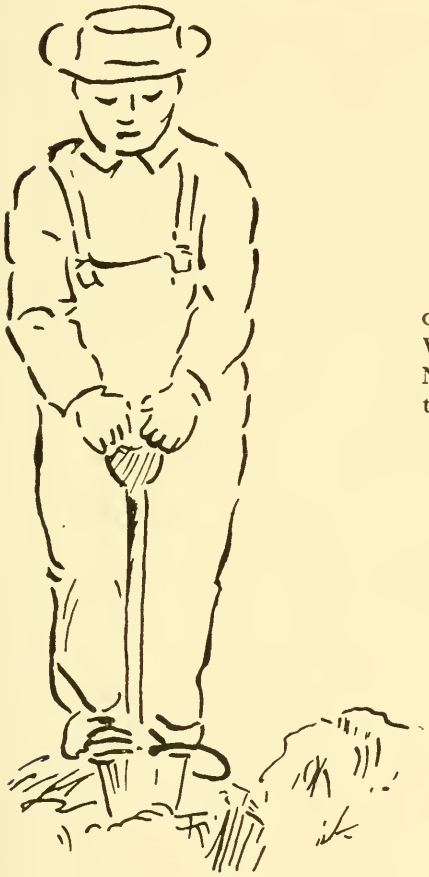
NEW HAMPSHIRE
AGRICULTURAL EXPERIMENT STATION

DIGGING UP FACTS FOR NEW HAMPSHIRE FARMS



A BRIEF SURVEY

of Some of the Research Work Conducted at the New Hampshire Agricultural Experiment Station

NEW HAMPSHIRE COLLEGE
OF
AGRICULTURE AND THE MECHANIC ARTS
AND
THE UNITED STATES DEPARTMENT OF AGRICULTURE
CO-OPERATING

To Friends of Agriculture in New Hampshire:

Within the compass of this booklet it is impossible to give more than a suggestive outline of some of the research work conducted at the New Hampshire Agricultural Experiment Station.

More detailed information will be found in the published Station reports and bulletins; and data regarding any particular phase of the work will gladly be furnished upon request.

J. C. Kendall
Director of Station.

Durham, N. H.,
June 1, 1921.

HOW BUSINESS LOOKS AT RESEARCH WORK

"We spend between $50,000 and $75,000 per annum for research work," replied one of the Chicago packers.

A large electric manufacturing company reports that it "estimates its annual expenditures for research work to be approximately $3,000,000, which represents slightly more than one per cent of its annual gross business."

"We have investigation work going on every minute of the time to work out something new that is worth more than the old in various classes of products," says a meat packing establishment.

One of the zinc-producing companies reports that it has a thoroughly modern laboratory, employing approximately 25 investigators who are supported by a large force of assistants. "It is, of course, obvious," they say, "that this department would not be continued if the results it accomplished did not give a return on the moneys appropriated."

Other concerns place their annual expenditure for research work at $300,000; at $180,000 to $300,000; at $150,000 to $200,000; at $10,000; and $250,000.

DIGGING UP FACTS FOR NEW HAMPSHIRE FARMS

A Brief Survey of Some of the Research Work Conducted at the New Hampshire Agricultural Experiment Station

Agriculture does an annual business in New Hampshire estimated at $40,000,000.

It represents an investment of $118,000,000.

If conceivably its affairs could be run on a centralized basis like that of the large industrial concerns, it would not hesitate to spend one per cent of its annual output for research work. This would amount to $400,000. One of these concerns, for example, itself partially engaged in agricultural work, reports that it spends an average of $2,000,000 a year for research work, and finds itself well repaid for so doing.

There is hardly a large business concern in the country which does not have its trained staff of investigators constantly at work on problems which will modify the future conduct of its affairs. To ascertain the truth of this statement the Experiment Station recently asked a large number of such concerns what amount of money they planned to spend each year for research work. Not a single one of them replied that they did not make such an appropriation; but on the contrary each stated that they spent substantial sums for a scientific study of the factors that influence their business. On the preceding page are quotations from some of these replies.

Just as the directors of a large commercial concern call in their research workers to consider questions which directly affect their business, so farmers of the state turn to the Agricultural Experiment Station with questions which mean the difference between profit and loss to them.

Top-Dressing
At a Profit
And at a Loss

Hay yield when nitrate is used.

Hay yield when no fertilizer is used.

In a Top-Dressing experiment that was conducted over a period of nine years the Station proved that a farmer could get a profit of $1.75 per acre by applying 200 lbs. of nitrate of soda to timothy and clover grassland. If this information were utilized on all of the New Hampshire land in these grasses, it would make a difference of $367,000 in the annual hay crop. Applications over a shorter period showed a net profit of $12.16 per acre in Grafton County, and the increased hay cost only $4.86 a ton. These figures of course fluctuate with the prices of nitrate and of hay.

On the other hand, it was proved that New Hampshire soils, particularly if of a heavy type, do not need potash for hay. Instead of using the prevalent 5-8-4 fertilizer, the farmer could save $2 an acre by using fertilizer without the potash.

Profit when potash is used.

Profit when potash is not used.

One of these questions is:

CAN WE AFFORD TO BUY FERTILIZER?

The farmers of the state buy an average of 17,000 tons of commercial fertilizers annually. Last year their fertilizer bill amounted to $600,000. They need to know:

On what crops they can use fertilizer with profit.

What amounts and what kinds they require for the different crops.

Whether they can mix their own fertilizers with a considerable saving.

What protection can be given them against fertilizers of poor quality or even of no value.

It is worth while noting that most of these problems have to be solved from the standpoint of *New Hampshire* conditions. Soils, freight costs, and kinds of crops vary greatly in different parts of the country. Helpful as the work of experiment stations in other states may be, New Hampshire has got to work out her own salvation in the last analysis.

Results of the top-dressing experiments are shown on the preceding page.

In similar fashion important experiments that have already been in process for over ten years at the Experiment Station orchards have demonstrated beyond question certain fertilizer facts which spell money to the commercial apple growers of New Hampshire.

One of these facts is that it does not pay to grow apples in sod unless the trees are mulched and fertilized with nitrate of soda. If this practice is not followed, the land should not be used for orchard purposes.

Another fact is that where the trees are cultivated, the yield in a run-down orchard may be increased nearly 100 per cent, without the use of any fertilizer at all.

Fertilizer does not pay for itself in a mature orchard, at least during the first ten years, if a system of clean cultivation is pursued.

COULD ALMOST DOUBLE CROP

These results are being written almost as axioms into the apple laws of the state. A few of the 850,000 bearing apple trees of New Hampshire are receiving the best of care, but the application of these results to the remainder would mean an increase of more than three bushels in the annual production per tree. Providing that not over one fourth of the uncared-for trees in the state are of the proper varieties, sound and well located, the commercial apple crop of the state would even then be increased on a conservative estimate from 100,000 to 200,000 barrels per year. This could mean an added revenue of $350,000 or more annually to the farmers of the state, and will actually mean a large sum.

The research work in orchard fertility has been of far-reaching importance, and has attracted national attention. Similar experiments are being conducted in vegetable gardening, which will have important bearing upon the $400,000 trucking industry of the state.

HOME-MIXING AIDED

Information regarding the best mixtures of fertilizers for various crops and the most profitable combinations of chemicals at current prices is furnished by the Experiment Station to farmers throughout the state.

This has resulted in aiding greatly the intelligent purchase and home-mixing of chemicals. By mixing his own fertilizers the farmer has been able to save an average of at least $8 a ton. Last year the estimated saving in this respect was from $10 to $24 a ton, with an average of $15. The Extension Service has made telling use of the fertilizer data compiled by the Station; and in three counties alone last year 750 tons of chemicals for home-mixing were ordered as a direct result of the work. This meant a saving to the buyers of over $11,000 in actual cash outlay.

In order to determine whether home-mixed fertilizers were of as high a quality as the factory-mixed goods, the Station secured samples from farmers in different sections of the state and compared them with the commercial product. The results showed that the farmer with a shovel, a broom, a tamper and a sand screen can do a pretty fair job. The variations in the complete factory-mixed goods were almost as wide as those found with the home-mixed fertilizers. This means that the saving to the

Typical apple tree in sod plot late in fall.

Typical apple tree in cultivated plot on same date.

farmer is an actual one, not to be discounted by his lack of equipment, and the experiment has given a solid footing to the home-mixing work.

ANALYSES PREVENT FRAUD

Perhaps of even greater importance is the steady annual inspection service which has been going on at the Station for twenty-two years since the passage of the Fertilizer Inspection Law, in co-operation with the State Department of Agriculture. The analyses made at the Station laboratory have made it possible for the State Department to prevent the sale of materials in the state for fertilizer purposes which are fraudulently misrepresented or which have no value. The protection afforded the farmers on the 17,000 tons of fertilizers which they use annually has been a real insurance. It has frequently frustrated the attempts of unscrupulous dealers to unload worthless materials at $20–$30 a ton.

These, then, are some of the ways in which the Experiment Station has been working to cut the farmer's fertilizer bill, or, perhaps one should say, to make his purchase and use of fertilizers more intelligent and discriminating.

Another question which hits the farmer's pocketbook in an even more vital spot is:

HOW CAN WE CUT OUR *GRAIN* BILL?

There is nothing that eats into the New Hampshire farmer's income so extensively as his purchase of commercial feedstuffs. During the past year he bought approximately 200,000 tons at a cost of over $12,000,000. No big commercial company would think of buying this quantity of materials without maintaining a laboratory to check carefully the quality of its purchases; and here again, as in connection with the fertilizer market, the Experiment Station performs a protective service. For fifteen years reports of analyses have been published, thus enabling the State Department to prevent the sale of fraudulent feedstuffs and enabling the farmer to determine which feeds give him the most for his money.

Each of these bags contains wheat feed. Each weighs 100 pounds. But an analysis at the Station laboratory showed that $1 bought 30 per cent more feeding value in the bag on the left than in the one on the right.

BALANCED RATION—THE KEY

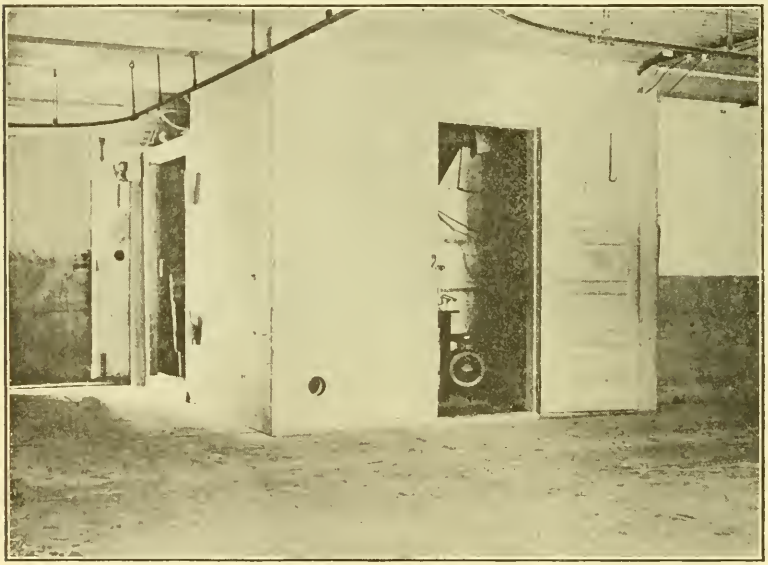
Whether or not the farmer makes a profit from the grain which he buys depends quite largely upon his success or failure in applying the principle of the balanced ration. For example:

	Corn meal 100 lbs.	*Wheat bran 100 lbs.*	*Linseed meal 100 lbs.*	*Oats 100 lbs.*	*Native hay 100 lbs.*
Cost.....	$3.00	$2.75	$3.40	$1.80	$1.50

At the above prices, which feed or which combination of feeds will give the farmer the most for his money? Knowing or not knowing the answer is likely to mean the difference between staying in business or quitting.

The principles that underlie the balanced ration are being worked out in the experiment stations of the country. The field is so large and so important that research activities along this line are being conducted in many places. Yet it is significant that

the New Hampshire Station is more than doing its share. In co-operation with the Carnegie Institution's Nutrition Laboratory there has been established at Durham the first respiration chamber of a simple inexpensive type for use with large domestic animals. By means of this chamber it is possible to determine with scientific accuracy and in a short time the influence upon cattle of a certain type of feeding, housing condition or other factors that affect animal growth. This work supplements and multiplies



The respiration chamber which gives the key to balanced rations.

the value of extensive investigations that have been conducted for many years at the Pennsylvania State College. As a result of it a number of feeding problems which directly concern New Hampshire are being solved. It has opened up a new field for the other state experiment stations of the country by demonstrating the possibilities of a respiration chamber, the cost of which is $1200, whereas the only others in existence cost tens of thousands.

For the first time by means of this chamber figures have been secured on the digestive value of native mixed hay; and when further analyses have been made, a more accurately balanced ration can be fed in the state than has hitherto been possible.

Where native hay forms such a large proportion of the feed used on our farms, its composition is of too much importance to trust to figures drawn on a nation-wide basis. In addition to the national value of the nutrition work done at the New Hampshire Station, therefore, there is a purely local significance.

LEGUMINOUS CROPS ENCOURAGED

In still other ways the Experiment Station has been at work to reduce the grain bill of the farmers of the state. It has been the motive power in bringing a number of leguminous crops into general use, and has demonstrated that these crops will go a good way toward taking the place of grain. Through the influence of the Station 126 plots throughout the state were sown in 1914 to Grimm alfalfa, and as a result this superior strain has been widely accepted as standard. The experimental work in soy beans has also laid the foundation for the development of this crop which is proving particularly valuable for silage purposes. Investigations are now under way to determine the value of sunflowers for silage, a matter which will have a particularly important bearing upon farming in northern New Hampshire, where early frosts prevent successful corn crops.

The range of the Station in dealing with feed problems may be illustrated by enumerating some of the bulletins published along this line:

Fifteen annual reports of analyses of feeding stuffs
The Soy Bean in New Hampshire
Feeding Sheep and Lambs: Clover Hay *v.* Native Hay; Turnips *v.* Dry Ration
Value of Silage in Winter Ration for the Breeding Flock
Alfalfa in New Hampshire
The Feeding of Farm Stock
Soiling Crops and Summer Silage
Variety Test of Mangels Grown on College Farm
Home-Grown Feeds for Poultry
Feeding the Winter Layers
Summer Feeding of Poultry
Feeding Pigs on the Farm
Corn Meal Middlings and Separator Skim Milk for Fattening Pigs
Silage Studies
Experiments in Pig Feeding
Experiments with Roots and Forage Crops
Cost of Raising Beef Cattle in New Hampshire

Home-Grown Dairy Feeds
Clover for the Dairy Herd
Rape for Sheep
Breeding and Feeding of Chicks

—and many others

Hand in hand with the question of cutting the grain bill goes another that in some respects affects it:

HOW CAN WE GROW BETTER CROPS?

Every year the seed catalogues are filled with lists of varieties all claiming superlative rank and asserting that the buyer's money should be invested in the particular brand described. No farmer can afford to dodge the question of varieties; and the intelligent purchaser is tempted to try them all with a view to ascertaining which do the best on his particular farm. This is an expensive process; and the field can be greatly limited by a state-wide system of experimentation. Furthermore, trials of varieties are without value unless they are conducted on a basis that insures equal conditions. Through the careful tests of the Experiment Station a representative list of the varieties best suited to the state can be made and narrowed down by the county Farm Bureau, or individual farmer, to fit the particular local needs. In this way all of the varieties unsuited by climatic conditions or to average New Hampshire soil are eliminated.

SOME OF THE VARIETY TESTS

Variety tests have already been made by the Station with field corn, oats, field beans, soy beans, wheat, root crops, forage crops, apples, peaches, plums, cherries, strawberries, raspberries, grapes, peas and tomatoes. Some of these have had a decided economic importance, as, for example, the narrowing of the leadership in apples to Baldwin, McIntosh, Wealthy and Gravenstein; and the variety tests with oats, corn, soy beans and tomatoes.

It is not only a function of the Experiment Station to try out different varieties but, where opportunity affords, to create new ones. In this way an improved strain of ensilage corn, named "New Hampshire 500," has been secured. On certain types of

A field of medium green soy beans.

A second crop of alfalfa on farm of Frank Smith, Lakeport, N. H.

soil this has outclassed other varieties and ranks with Leaming, Eureka, and others as standard for the state. Breeding experiments at the Station have also produced a superior strain of forcing cucumber, which is now disseminated throughout New England under the name of "The Granite State." It is planned to start other experiments of a similar nature with a view to giving to the state strains of common garden vegetables especially adapted to New Hampshire conditions.

NEW TIMOTHY STRAIN BEING BRED

Timothy hay, which has hitherto not had the advantage of breeding work, has for several years been the object of some special investigations which will shortly make it possible to furnish an improved strain of seed to farmers in the state.

Selecting timothy to secure an improved strain.

Testing of seeds for purity and germination is another service which the Station laboratory performs. If the seed which the farmer buys contains a large amount of foreign matter, or if a good proportion of it will not sprout, there is a serious loss in the crop. Good seed is fundamental to good farming; and the Station has not only conducted the official tests for the State Department for ten years, but has tested consignments of seed for farmers in general throughout the state. The importance of seed testing may be realized when it is considered that in different years there has been a variation of from 43 to 80 per cent in the number of samples meeting the guarantee for germination.

POTATO SEED BRINGS 114-BUSHEL INCREASE

An experiment conducted with regard to certified Maine potato seed showed a yield of 416 bushels per acre, an increase of 114 bushels over the alternate rows of non-certified Maine seed. This experiment was run in 1920, and as a result orders for 6000 bushels of certified seed were placed by farmers in the state for the next spring. If this seed continues to produce such high yields the effect of its introduction in future crops will be very great.

ORCHARD PRUNING AND FORESTRY INVESTIGATIONS

Not all of the work for better crops is confined to the question of seeds and the breeding and testing of varieties. The Station is conducting an important long-time experiment to determine the best system of pruning in the orchard. Its experiments in thinning fruit have demonstrated that the percentage of Number 1 apples may in seasons when the set is very heavy be increased from about 40 per cent to nearly 70 per cent. It is studying the effect of ringing; and its research work in fruit bud formation has resulted in scientific data of national importance. Its Forestry Department is studying the conditions which are most favorable for the growth of the various tree species; and in determining the cost of thinning immature white pine it is conducting an experiment that is likely to have an important bearing on the handling of the white pine crop, the state's third most important source of agricultural income. The storage of vegetables in pits has been investigated, and the best methods of pit storage under climatic conditions in the southern part of the state have been determined. The cost and methods of land drainage, which were determined

"SOME TIPS ON NEW HAMPSHIRE CORN."

The central ear is "New Hampshire 500."

several years ago, aroused widespread interest in the state, and these data will again be serviceable when the price of land tile is no longer prohibitive. In these ways and many others, the experimental fields, orchards, pastures and woodlands are being utilized in the work to reduce the cost of production.

FARM ANIMALS DECREASE

The decline in improved acreage throughout the state, as shown by the recent census, has made every one who has the future of New Hampshire at heart pause and consider. One of the factors which is inevitably linked with this matter is the decline in the number of farm animals. Since 1880 the state's animal population has dropped from 317,300 to 182,700 in 1920; and it is a foregone conclusion that it will increase again only in so far as it can be demonstrated that live stock will insure a profit. The whole question of abandoned farms and soil fertility is bound up in the question:

HOW CAN WE RAISE LIVE STOCK MORE PROFITABLY?

There are only three ways in which improvement may be obtained: through feeding, breeding, and selection. The work done by the Station toward improved feeding practices has already been considered. Its research work in breeding and selection is no less important and may be summed up as follows:

The Station determines the essential qualities that make an animal profitable.

It has demonstrated how to select and breed animals suited to our local conditions.

It is the center of the movement to turn the scrub herds and flocks of this state into profitable grades by demonstrating to farmers the economic value of the purebred sire.

The robber cow, the scrub steer, the razorback hog and the sheep that was bred for wool only have contributed materially to increase the number of abandoned farms in New Hampshire. Unless better breeding and selection are practised, we may expect no improvement in our live stock industry.

It is perhaps significant of the Experiment Station's work in animal husbandry that it has won the personal attention and

"The New Hampshire Experiment Station has undertaken a more extensive and better devised set of experiments in sheep breeding than is being undertaken anywhere else in the world; and it seems as certain as anything can be that it will, in time, obtain results that will not only attract the attention and win the approbation of the civilized world, but will revolutionize the methods of improving sheep and making new strains fitted to special needs. These are large claims; I wish in a few words to justify them. . . ."

Statement of Dr. C. B. Davenport, famous scientist and director of the Station for Experimental Evolution of the Carnegie Institution of Cold Spring Harbor, Long Island, New York.

co-operation of two of the most outstanding scientists in this field in the country—Dr. C. B. Davenport, head of the Carnegie Station of Experimental Evolution, and Dr. F. G. Benedict, director of the Carnegie Nutrition Laboratory, who has collabo-

Shearing at the Experiment Station.
The inheritance of wool characteristics has been one of the factors studied in the sheep-breeding work.

rated in the nutrition studies. These men enjoy an international reputation, and would hardly come to New Hampshire to participate in the experimental work here if they did not consider the work of prime importance. Dr. Davenport's statement regarding the sheep breeding experiments at Durham is given on the preceding page.

COST OF MILK FIGURES OBTAINED

One of the first moves preliminary to the present organization of the dairy industry in the state was the Station's survey in 1905, which was followed up by studies on the cost of milk production. These milk-cost figures have been an invaluable foundation for the later studies conducted by the College Extension Service which have had such a potent influence in securing a fair price for milk.

The Advanced Registry tests of dairy cattle are conducted by the Station. During the past three years tests have been supervised for 512 cows and official seven-day tests for 184 cows. Reports obtained in connection with this work show that offsprings of dams with A. R. records bring from 25 per cent to 75 per cent more than offsprings from dams without records. As part of the service work of the Dairy Husbandry Department samples of milk and cream are tested upon request; all glassware used in the Babcock tests is calibrated for accuracy; and examinations are given for all who buy milk or cream on a butterfat basis. That the College and Station practice what they preach in dairying is shown by the records of the dairy herd that has been built up. While this herd is not used for experimental purposes, it serves as an illustration of what may be done with careful feeding and management. One of its purebred Ayrshires, for example, has made a record of 688 pounds of butterfat, and one of its purebred Guernseys a record of 583 pounds. The cows are fed only with grain available to any farmer in the state, and the roughage used is hay and silage with some beet pulp.

FIGURES SECURED ON BEEF CATTLE

An example of the value which the Station may be in determining answers to definite questions arising in the state is well illustrated by the feeding tests with beef cattle. When hay is plentiful, many a farmer considers whether or not it may profit-

Penka Howie of the College herd who has made a record of 688 lbs. of butterfat.

Beef Cattle Used in Feeding Tests at Station.

ably be turned into beef. In order to assist in settling this matter the Station secured ten Hereford steer calves, and putting itself in the place of the farmer fed native hay balanced with cottonseed meal and wheat bran, keeping careful figures on costs and profits. The results, which are set forth in the bulletin on "Cost of Raising Beef Cattle in New Hampshire," give as definite an answer to this problem as it is possible to make.

TAXES LEVIED BY DISEASES AND PESTS

And now let us speak of taxes. The levy made upon farm land and buildings by the State of New Hampshire is in many ways the least important of the taxes which the farmer has to pay. The bill which is presented every year by the insect pests and plant and animal diseases in the state amounts—on a conservative estimate—to at least $3,500,000; and it is paid in full. The potato blight, flea beetle, aphis, gypsy moth, tuberculosis of dairy cows, hog cholera, etc., know no mercy; and many of them would confiscate the entire crop if no control measures were practised. As it is, there is perhaps no question asked so insistently of the Experiment Station as:

HOW CAN WE REDUCE THE TAXES PAID TO PESTS AND DISEASES?

If a thief were abroad in the state who each year stole three and a half millions of dollars, there would be almost no limit to the amount of a state-wide subscription to detect the guilty person and to put a stop to the outrageous loss of property. Yet the tribute paid to pests and diseases by the farmers of the state is no less enormous because it is insidious.

Research work in most state experiment stations includes veterinary science, but has had to be confined at the New Hampshire Station principally to plant diseases and insect pests. Here the results of the work have shown very real returns on the investment.

Previous to the formation of departments in botany and entomology at the Station in the early nineties, little was known of either the fungous diseases or insect pests that damaged the

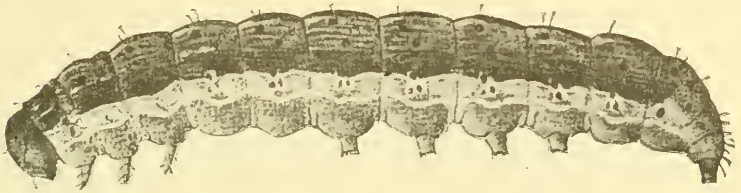
A BILL

To the State of New Hampshire

Potato diseases and pests	$600,000
Apple Maggot and codling moth	200,000
Pests and diseases of hay, grain and forage crops	800,000
Abortion and tuberculosis of cattle	700,000
Hog cholera	50,000
White diarrhea of poultry	250,000
Gypsy moth and other forest pests	600,000
Other diseases and pests	300,000
Total	$3,500,000

These charges are collected on the spot.

Annual tribute on New Hampshire crops by plant and animal diseases and insect pests.



One of the tax collectors.

agricultural crops of the state; and because of this lack of knowledge, the control in successive seasons was extremely variable, sometimes good, sometimes bad. Since that time a steadily increasing fund of information has been gathering in regard to the losses from these causes and the methods of control. Special researches on the diseases most difficult to control have brought results.

For example, the Brooks spot of apple, a disease that had long caused considerable injury to fruit throughout New England and particularly in New Hampshire, was traced to a fungus not previously known to have infected apples. Methods of preventing the development of the fungus were devised, and today in well-cared-for orchards losses due to it are no longer of material importance.

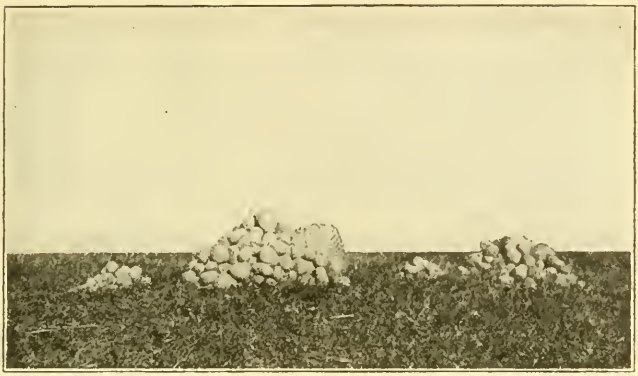
BROWNTAILS AND GYPSIES STUDIED

No sooner had the browntail and gypsy moths appeared in the state than they were immediately made the objects of special studies at the Station; the information regarding them was spread through the state; and there has been the closest possible touch throughout between the agencies combating them and the entomological laboratory at Durham. Because of the prevalence of spraying for browntails in August, for example, the question was raised as to the danger of poisoning persons eating the fruit, or of poisoning the live stock eating the grass or hay from beneath sprayed trees. This subject was given detailed study; and it was demonstrated that the spraying could be conducted safely.

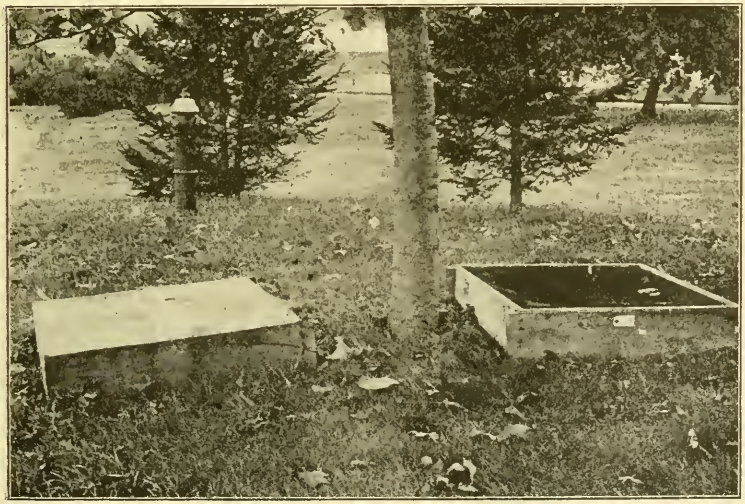
INVESTIGATIONS IN BORDEAUX MIXTURE

In similar fashion the Station has been the central source of information regarding the control of potato diseases in the state. Many of the fungicides recommended in the literature on this subject have been found to possess no real merit at all. On the other hand, a study of Bordeaux mixture has resulted in a number of modifications in the practice of spraying for late blight which permit a higher degree of protection from rot than has hitherto been obtained. The importance of this work may be realized when it is considered that the loss from late blight in the season of 1919 was estimated at $1,500,000. For every 100 potatoes lost where spraying was not done, nearly 8 would still be lost by the ordinary Bordeaux mixture, called "4-4-50." By using an 8-4-50 mixture, however, the Station demonstrated that complete control could be secured. The thoroughness with which the mixture is applied was shown to be another important factor, a pressure of 180 pounds securing fifteen times as much protection as a pressure of 60 pounds.

A disease almost as serious to the potato industry of the state is mosaic, which it is estimated affects 20 per cent of the fields, causing a decrease each year in vigor of the plants and cutting the annual potato yield by over 200,000 bushels. Experiments have shown that the yield of healthy plants is 25 per cent greater than from plants affected with this disease.



Results from equal areas of sprayed and unsprayed potatoes. The two piles at the left were dug from a sprayed plot, the ones at the right from an unsprayed plot. The use of control measures universally throughout the state in 1919 would have meant a difference of $1,500,000 in the state's potato crop.

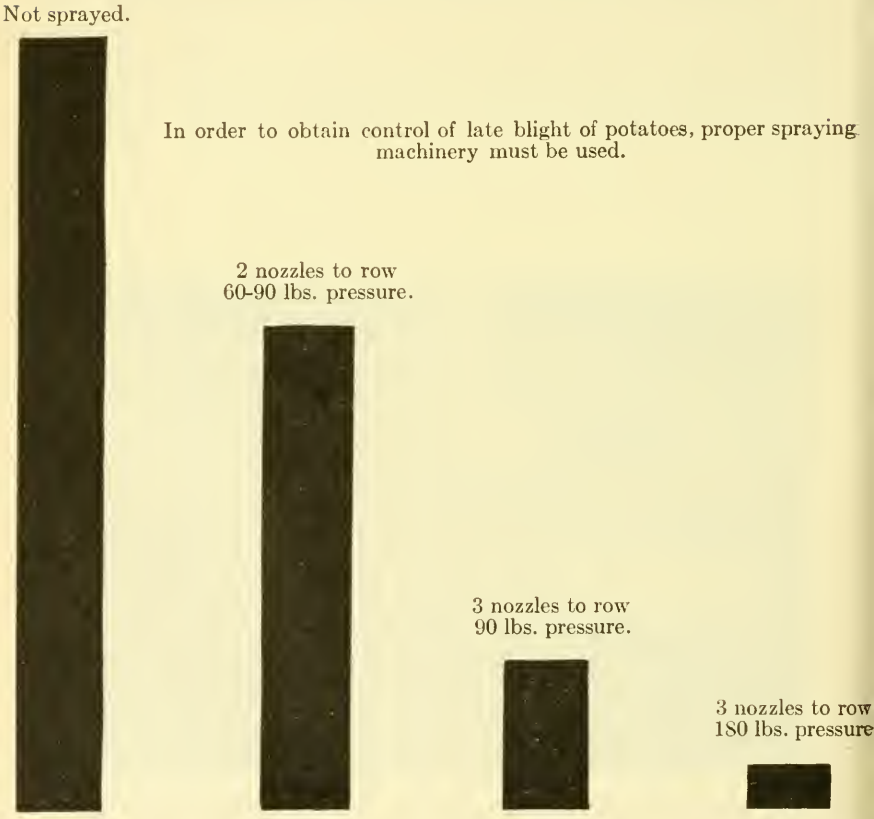


Ground cages in which apple maggots were studied at Experiment Station.

WHAT THREE IMPORTANT PESTS MEAN

The codling moth and apple maggot (or railroad worm) are the two most serious pests attacking apples in the state, being responsible for most of the wormy fruit. Their control has been essential to the development of the apple industry. In like manner the root maggot, which infests onions, cabbage, cauliflower, turnip, radish, etc., has damaged root crops to the extent of 25 per cent of the annual crop.

A thorough investigation of these three pests at the Station—each conducted over a period of several years—has demonstrated


Not sprayed.
In order to obtain control of late blight of potatoes, proper spraying machinery must be used.
2 nozzles to row
60-90 lbs. pressure.
3 nozzles to row
90 lbs. pressure.
3 nozzles to row
180 lbs. pressure

Rotten tubers harvested (relative numbers).

Showing the work of apple worm (codling moth) which entered at the calyx and left through the side.

control measures, the general adoption of which throughout the state would mean an annual saving as follows:

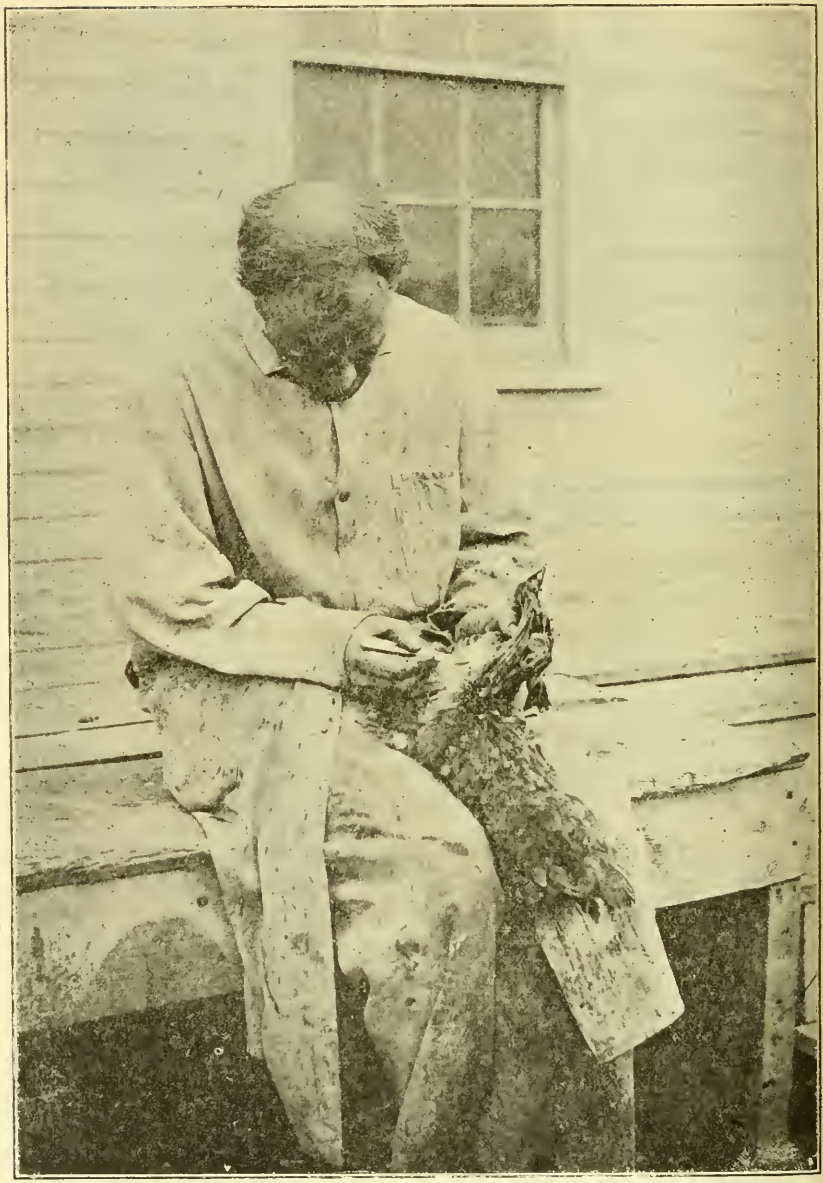
	Average annual value of crop attacked	*Estimated loss due to pest*	*Per cent of loss controlled*	*Possible annual saving from control measures*
Codling Moth.....	$1,078,582	$134,822	90	$121,340
Apple Maggot.....	1,078,582	67,411	95	64,040
Root Maggot.....	107,155	35,718	85	30,360
Total possible saving from these three lines of work.....				$215,740

OTHER PESTS STUDIED

Among the other pests of economic importance which have been studied at the Station and for which effective control, either in whole or in part, has been advised, are the following: grasshoppers, white ants, apple leaf miner, fall webworm, black flies, San José scale, white fly of greenhouses, spiny elm caterpillar, forest test caterpillar, canker worm, army worm, tent caterpillar, yellow-necked apple caterpillar, red-humped apple caterpillar, hickory tiger moth and rusty tussock moth. In a number of cases original control measures have been devised.

WHITE DIARRHEA WORK

Practically the only work to combat animal diseases which it has been possible to do at the Experiment Station has been the



Taking blood sample of a hen to be tested for white diarrhea.

project dealing with white diarrhea of chickens. The losses of newly hatched chicks in the state, amounting to an average of 50 per cent over a period of years, called attention to the dire necessity of work along this line. Investigations by the Poultry Department showed that breeding from disease-free stock would mean a reduction of nearly 30 per cent in the losses. With this information an intensive campaign to eradicate the disease from the state was started, and tests of blood samples taken from various flocks were made. The Station placed its bacteriological laboratory at the service of the work, charging only a nominal fee per bird to cover actual expense. The first year 4000 samples were tested, the next 11,000, and the number has reached 17,000 this season.

The total number of chicks hatched in the state in a year is probably around 3,000,000. If the mortality can be lowered from an unusually high figure to a normal or low figure by means of the white diarrhea testing, the saving will surely run into many thousands and the effect of the work will go on for many poultry generations. That this is not too much to be expected has already been shown by the results. Many poultrymen in the state have reported losses as high as 60 per cent of all chicks hatched in years before the testing was done, and losses since the testing running as low as 5 to 8 per cent. Out of 60 flocks tested, 42, or 60 per cent, were found to be infected.

AVENUES OF INFORMATION OPENED

These, then, are some of the questions vitally affecting the agriculture of the state, which are put up to the Experiment Station, and some of the answers which the Station has made. The gradually increased fund of information obtained has been put before the people in a number of ways:

Through correspondence. It is estimated that an average of twenty letters a day from residents of the state asking for information along every conceivable agricultural line are handled.

Through bulletins, 250 of which (exclusive of extension publications) have been issued, with a total circulation of 2,926,000 copies.

Through newspaper articles, 182 of which dealing with Station material, have been published in the papers of the state in the last six months.

Through addresses by members of the Station staff before Granges, Farmers' Institutes, Farm Bureau meetings, etc.

Through the regularly established Extension Service, in cooperation with the College, the counties, and the United States Department of Agriculture.

PURPOSES OF EXPERIMENT STATIONS

On the principle that research work is vital to farming interests, agricultural experiment stations have been established in every state in the Union as well as in Guam, Hawaii, Porto Rico and Alaska. The New Hampshire Station was founded in 1888. In general the work of the stations has been classified as follows:

(1) They act as bureaus of information on many questions of practical interest to the farmers of the state.

(2) They seek by practical tests to devise better methods of agriculture and to introduce new crops and live stock, or to establish new agricultural industries.

(3) They aid the farmer in his contest with insects and with diseases of his crops and live stock.

(4) They help to defend the farmer against fraud in the sale of fertilizers, seeds, spray materials and feeding stuffs.

(5) They investigate the operations of nature in the air, water, soil, plants and animals in order to find out the principles which can be applied to the betterment of the processes and products of agriculture.

The Experiment Station is the farmer's laboratory where he secures the information which is of as vital importance to him as is the specialized laboratory of the large business corporation.

Already the annual appropriations of $30,000 which the Federal government has been spending in New Hampshire of recent years for agricultural research work have borne fruit in many improved agricultural practices, and the state itself has now recognized the Experiment Station with an important appropriation. It cannot be too strongly emphasized that the agricultural research laboratory, the experimental plots and orchards, the feeding chamber, the breeding pen, are a straight business proposition that is inevitably bound up with the future of New Hampshire's farms.